Claims

WHAT IS CLAIMED IS:

1. A method of de-interlacing interlaced fields of video to produce an image frame comprising:

determining a motion value, on a pixel by pixel or group of pixel basis, associated with each of a plurality of pixels in the interlaced fields based on pixel intensity information from at least two neighboring same polarity fields; and

generating a motion history map containing recursively generated motion history values for use in de-interlacing the interlaced fields wherein the recursively generated motion history values are based at least in part on a decay function.

2. The method of claim 1 wherein producing the motion history value includes adding a detected pixel intensity difference to the decayed motion value wherein the detected pixel intensity difference is based on pixel intensity information from a next neighboring same polarity field.

3. The method of claim 1 including selecting a suitable de-interlacing technique based on the motion history map, to produce the image frame.

4. The method of claim 1 wherein each motion history value is based on at least three motion values and wherein one of the three motion values is associated with a pixel in an adjacent different polarity field.

5. A method of de-interlacing interlaced fields of video to produce an image frame comprising:

determining a motion value, on a pixel by pixel basis or a group of pixel basis, for a plurality of pixels in the interlaced fields based on pixel intensity information from pixels in at least two neighboring same polarity fields;

generating a motion history map for use in de-interlacing the interlaced fields by producing a motion history value for each of the plurality of pixels, by recursively updating each motion value by at least applying a decay function to each of the plurality of the motion values to produce a decayed motion value and by adding a detected pixel intensity difference to the decayed motion value wherein the detected pixel intensity difference is based on pixel intensity information corresponding to a same pixel location from a next neighboring same polarity field;

storing the motion history map; and

selecting a suitable de-interlacing technique for each pixel of interest or group of pixels based on a corresponding motion history value in the motion history map, to produce the image frame.

6. The method of claim 5 including storing the motion history map as a down-sampled data representing blocks of pixels.

7. A de-interlacer operative to de-interlace interlaced fields to produce an image frame comprising:

recursive motion history map generating circuitry operative to determine a motion value, on a pixel by pixel or group of pixel basis, associated with one or more pixels in the interlaced fields based on pixel intensity information from at least two neighboring same polarity fields; and operative to generate a motion history map containing recursively generated motion history values for use in de-interlacing

the interlaced fields wherein the recursively generated motion history values are based at least in part on a decay function; and

de-interlacing circuitry operatively responsive to the recursively generated motion history values that are based at least in part on the decay function, and operative to provide de-interlaced output pixel information.

8. The de-interlacer of claim 7 wherein the motion history map includes data representing motion history values for even fields and odd fields and including memory containing the motion history map values.

9. The de-interlacer of claim 7 wherein the de-interlacing circuitry is operative to provide adaptive de-interlacing on a pixel or block of pixel basis, based on the recursively generated motion history map values such that at least one of temporal and spatial filtering is provided to produce output pixels for the image frame.

10. The de-interlacer of claim 7 wherein the recursive motion history map generating circuitry overwrites previously stored recursively generated motion history values in memory in response to evaluating each additional adjacent same polarity field.

11. A graphics processor comprising:

a 3-D pipeline having a programmable shader and wherein the programmable shader is programmed to operate as recursive motion history map generating circuitry operative to determine a motion value, on a pixel by pixel or group of pixel basis, associated with each of a plurality of pixels in the interlaced fields based on pixel intensity information from at least two neighboring same

polarity fields; and operative to generate a motion history map containing recursively generated motion history values for use in de-interlacing the interlaced fields wherein the recursively generated motion history values are based at least in part on a decay function; and as

de-interlacing circuitry operatively responsive to the recursively generated motion history values that are based at least in part on the decay function, and operative to provide de-interlaced output pixel information.

12. The graphics processor of claim 11 wherein the programmable shader is operative to provide adaptive de-interlacing on a pixel or block of pixel basis, based on the recursively generated motion history map values such that at least one of: temporal, spatial filtering and a blend of the two, is provided to produce output pixels for the image frame.

13. The graphics processor of claim 12 wherein the programmable shader overwrites previously stored recursively generated motion history values in memory in response to evaluating each additional adjacent same polarity field.

14. A method of de-interlacing interlaced fields of video to produce an image frame comprising:

determining a motion value, on a pixel by pixel or group of pixel basis, associated with each of a plurality of pixels in the interlaced fields based on pixel intensity information from at least two neighboring same polarity fields;

generating a motion history map containing recursively generated motion history values for use in de-interlacing the interlaced fields wherein the

recursively generated motion history values are based at least in part on a decay function such that:

an even current recursively generated motion history map is generated based on even field information,

an odd current recursively generated motion history map is generated based on odd field information;

saving at least one of the even and odd current recursively generated motion history maps; and

using the even current recursively generated motion history map, the odd current recursively generated motion history map and the previously generated motion history map to determine an appropriate de-interlacing operation.

15. The method of claim 14 including:

generate a temporally interlaced pixel value;

generating a maximum allowable difference between an output pixel value and the temporally de-interlaced pixel value, based on the motion history map values;

generate a spatially interpolated pixel value; and

use the spatially interpolated pixel value as the output pixel if the spatially interpolated pixel value is within a value range between the temporally de-interlaced pixel value plus or minus the maximum allowable difference, otherwise clamp the spatially interpolated pixel value to the closer of the temporally interlaced pixel value plus the maximum allowable difference or the temporally interlaced pixel value minus the maximum and use the clamped pixel value as the output pixel value.

16. A method of de-interlacing interlaced fields of video to produce an image frame comprising:

determining a motion value, on a pixel by pixel or group of pixel basis, associated with each of a plurality of pixels or group of pixels in the interlaced fields based on pixel intensity information from at least two neighboring same polarity fields;

generating a motion history map containing recursively generated motion history values for use in de-interlacing the interlaced fields wherein the recursively generated motion history values are based at least in part on a decay function;

generating a motion compensated de-interlaced pixel or group of pixels based on motion vectors; and

using the recursively generated motion history values to determine whether the motion compensated de-interlaced block is suitable as output pixel information for the image frame.

17. The method of claim 16 wherein using the recursively generated motion history values includes generating a motion history value based motion detection value for a pixel of interest, or group of pixels of interest, based on a plurality of neighboring recursively generated motion history values and a previous recursively generated motion history value from the motion history map and using the motion history value based motion detection value to determine a suitable de-interlaced output pixel or group of pixels.

18. The method of claim 17 wherein generating a motion history map includes generating a down-sampled frame based motion history map containing weaved decayed motion values corresponding to even fields information and odd fields information; and wherein the method includes generating weaved block data from even and odd field data to produced a weaved block and wherein using the motion history map to determine whether the motion compensated de-interlaced block is suitable as output pixel information for the image frame includes comparing the motion history value based motion detection value to a threshold value and selecting at least one of: the weaved block data and the motion compensated de-interlaced block as an output pixel block.

19. The method of claim 18 including varying the threshold based on a determined noise level.

20. The method of claim 18 wherein selecting at least one of: the weaved block data and the motion compensated de-interlaced block as an output pixel block includes blending the weaved block data and the motion compensated de-interlaced block.

21. A de-interlacer operative to de-interlace interlaced fields to produce an image frame comprising:

recursive motion history map generating circuitry operative to determine a motion value, on a pixel by pixel or group of pixel basis, associated with each of a plurality of pixels in the interlaced fields based on pixel intensity information from at least two neighboring same polarity fields; and operative to generate a motion history map containing recursively generated motion history values

for use in de-interlacing the interlaced fields wherein the recursively generated motion history values are based at least in part on a decay function; and

de-interlacing circuitry operatively responsive to the recursively generated motion history values that are based at least in part on the decay function and operative to provide de-interlaced output pixel information, including:

a motion compensation based de-interlacing circuit operative to generate a motion compensated de-interlaced pixel or group of pixels based on motion vectors;

a non-motion compensation based de-interlacing circuit operative to generate weaved pixel data from even and odd field data to produce a weaved pixel or group of pixels; and

a de-interlacing technique selector circuit operative to use the recursively generated motion history values to determine whether the motion compensated de-interlaced pixel or group of pixels is suitable as output pixel information for the image frame.

22. The de-interlacer of claim 21 wherein the de-interlacing circuitry includes a motion history value based motion detection value generator operative to generate a motion history value based motion detection value for a pixel of interest, or group of pixels of interest, based on a plurality of neighboring recursively generated motion history values and a previous recursively generated motion history value from the motion history map and using the motion history value based motion detection value to determine a suitable de-interlaced output pixel or group of pixels.

23. The de-interlacer of claim 21 wherein the recursive motion history map generating circuitry generates a down-sampled frame based motion history map containing weaved decayed motion values corresponding to even fields information and odd fields information; and wherein the de-interlacing technique selector compares the motion history value based motion detection value to a threshold value and selects at least one of: the weaved pixel or block of pixel data and the motion compensated de-interlaced pixel or group of pixel data as output pixel information.